Memorandum

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From: Jennifer Peers, Stratus Consulting Inc.

Date: 12/19/2007

Subject: Comments on Gasco Draft FFS Reports

This memorandum contains comments provided by Stratus Consulting on behalf of the Confederated Tribes of The Grand Ronde Community of Oregon, the Nez Perce Tribe, the Confederated Tribes of Siletz Indians of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon. Thank you for considering these comments.

The following comments pertain to the Groundwater/DNAPL Source Control Focused Feasibility Study: NW Natural "Gasco" Site, prepared by Anchor Environmental, L.L.C. in November 2007 (NW Natural FFS) and the Focused Feasibility Study: Siltronic Corporation prepared by Maul Foster & Alongi, Inc. on October 22, 2007 (Siltronic FFS).

Please note that Stratus Consulting is providing these comments after a rapid review of these two documents in isolation; we have not had an opportunity to review the underlying data or the Remedial Investigation (RI) reports. We first present some overall observations and comments, and then some more specific comments for each document.

Overall comments

These Feasibility Studies are for interim actions that are part of a short timeline. In the NW Natural FFS, it is noted that the Remedial Investigation and the Risk Assessment have not yet been approved by DEQ. In both reports, the results of several studies are presented that have not been validated or reviewed, but are nonetheless relied upon. This is a concern, and we recommend that all data and supporting reports and studies be thoroughly evaluated by qualified engineers prior to selection of a remedy.

Another important concern is that the two reports are inconsistent in their understanding of the site conceptual model and the fate and transport mechanisms at the site. For example, the NW Natural FFS determines that enhanced in-situ bioremediation treatments are likely to be unsuccessful because of the heterogeneity of the subsurface and presence of interbedded silt lenses (p. 47) yet the Siltronic FSS has chosen enhanced in-situ bioremediation as their preferred remedial alternative and claim to have successfully demonstrated its efficacy in their enhanced in-situ bioremediation pilot study (Section 1.3 in the Siltronic FSS). Further, the selected alternatives need to be considered together because of the potential effects on each other. The authors of the Siltronic FFS suggest that the selected remedy in the NW Natural FFS will negatively impact the success of their selected remedy but do not attempt to adapt their selected remedy to account for this. Additional coordination is clearly necessary.

Finally, both reports seem to be stressing the need for rapid decision-making. The Siltronic FFS even suggests that a public comment period be waived. Although rapid cleanup is desirable, if selection of a remedy is not appropriately evaluated the risk of failure increases. Public involvement at this site in the context of the overall Portland Harbor cleanup is particularly important.

Specific Comments on NW Natural FFS

The NW Natural FFS evaluates the alternatives based on physical goals because there are no "numeric guidelines or points of compliance specific to source controls" (p. 30). Although this may be true, long term monitoring performance criteria should include some evaluation of chemical concentrations. "Supporting Chemical Guidelines" are presented in Section 4.2.2 (p. 32) of the NW Natural FSS; however a clearer definition of the chemical action levels at this site and a more thorough examination of the applicable or relevant and appropriate requirements (ARARs) should be incorporated into the NW Natural FSS. For example, the ambiguity presented in the second paragraph, first line, of Section 4.2.2 (p. 32) relative to meeting chemical screening levels should be clarified.

The delineation of DNAPL in the figures in Appendix G is only for "potentially mobile" DNAPL. Other areas of DNAPL at the site discussed in the text may represent ongoing sources of contamination of concern to DEQ. These areas are not depicted in these figures and were not surveyed with the TarGOST survey method. This represents a potential data gap.

On pages 41-42, the report's authors state that groundwater pumping-induced gradient reversals and "gravitational forces" will prevent DNAPL located deeper than the river bottom from migrating to and upward into the river channel. This later becomes part of the justification for a physical barrier only down to the river depth. Our experience at other manufactured gas plant (MGP) sites with similar DNAPL materials indicates that this assumption is not a reasonable one. MGP DNAPLs (e.g. coal tar), although more dense than water, can migrate against gravity and hydraulic gradients (U.S. EPA 2006; U.S. EPA 1991). It is possible that the wall, in

combination with the pump and treat system, would be effective, but this assumption is unsettling. A thorough evaluation of the RI data and other information on groundwater flow and DNAPL migration should be conducted by a qualified engineer before assuming that DNAPL would not migrate vertically or continue to migrate beneath the containment wall into the river bed.

The NW Natural FFS indicates that a monitoring program will be designed as a part of source control design (p. 63). This is an important element of any selected remedy and particularly ones that involve pump and treat systems. It would be good to elaborate more in the FFS.

We agree with the proposed seepage meter study in Section 3.3.1 of the NW Natural FSS and believe that these data should be evaluated prior to selection of a site remedy at both the NW Natural and the Siltronic sites.

The NW Natural FFS does not describe how treated water from the pump and treat system will be disposed, nor what water quality standards it must meet. The system will be designed to remove all petroleum derived contaminants of interest and free cyanide to below 10 μg/L (p. 64), but does not discuss total cyanide, nor how the design effectiveness will be evaluated.

Specific Comments on Siltronic FFS

The Siltronic FFS only presents one type of technology as a remedial alternative (in addition to no-action and monitored natural attenuation) rather that a full suite of alternatives as presented in the NW Natural FFS. The Siltronic FFS only compares various configurations of an enhanced in-situ bioremediation program. Other types of technologies, in particular a pump and treat system similar to that selected as a component of the selected alternative in the NW Natural FFS, would also be appropriate and should be considered.

A fundamental concern with the chosen remedial alternative presented in the Siltronic FSS is the potential risk associated with failure. The authors indicate that a successful pilot-scale study supports the effectiveness of enhanced in-situ bioremediation (EIB). However, there are always differences between small-scale pilot studies and a full remedy. The scale, methods and results of the pilot study should be thoroughly reviewed by a qualified engineer before approval.

The reductive dechlorination pathway (biodegradation) cited by the authors (Section 1.3, p. 1-3) progresses as follows: trichloroethene (TCE) degrades to dichloroethene (DCE) isomers, which degrade to vinyl chloride (VC), and finally to the non-toxic degradation daughter product ethene (U.S. EPA 1998). The produced VC is more toxic than either TCE or DCE. In aerobic conditions, VC is rapidly degraded, but under reducing conditions VC is degraded more slowly than TCE and tends to accumulate (U.S. EPA 1998; Freedman and Gossett 1998). If the degradation enhancement products fail to completely interact with the VC-producing areas of the plume, this degradation process could stall and VC could accumulate and eventually be

transported to the river. This type of failure may result from an incomplete or inaccurate site conceptual model, changes in aquifer flow patterns induced by artificial pumping, mineral deposition within the aquifer matrix, or physical barriers to groundwater flow. In short, the potential for the selected remedy to fail to prevent releases of hazardous substances exists and the risks should be thoroughly evaluated in comparison to other technologies (which was not done in the Siltronic FFS). We recommend that all of the supporting documentation for this remedy be thoroughly examined by a qualified engineer with experience in the application and evaluation of this technology.

Hydraulic conductivity at the site is estimated based on slug testing, rather than pump tests (Section 1.4.2). Slug tests generally are less reliable and often result in lower estimates of hydraulic conductivity than pump tests. This could affect the accuracy of the conceptual site model and remedial design, and a pump test may be warranted.

In Section 2.2.3.1 (p. 2-4) the authors note that the injection of EHC, a carbon/iron mixture, will not increase the residual iron in the aquifer. This claim should be supported since the authors note that the aquifer already has high concentrations of iron (p. 2-6) and that high iron concentrations could "represent an impediment to operation of a groundwater-extraction system," which is presented as a preferred remedial alternative in the NW Natural FSS. Again, this points out the need for better coordination between the remedies at the two sites.

The term "fatal flaw" is used on three occasions (pp. 2-5, 3-8,4-3) by the authors throughout the FSS to describe potential problems identified (but sometimes undefined) through their analysis. Although not a technical comment, this sort of language should be eliminated from the document as it has the potential to create misunderstanding regarding the gravity of the concerns raised by the authors.

Citations

U.S. EPA. 1991. Ground Water Issue: Dense Nonaqueous Phase Liquids. U.S. Environmental Protection Agency. EPA/540/4-91-002.

U.S. EPA. 1998. *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water,* U.S. Environmental Protection Agency. EPA/600/R-98/128, September.

U.S. EPA. 2006. Innovations in Site Characterization Case Study: The Role of a Conceptual Site Model for Expedited Site Characterization Using the Triad Approach at the Poudre River Site, Fort Collins, Colorado. Available at: http://www.clu-n.org/download/char/poudre_river_case_study.pdf

Freedman, D. and J. Gossett. 1989. Biological Reductive Dechlorination of Tetrachoroethylene and Trichloroethylene to Ethylene under Methanogenic Conditions, *Applied and Environmental Microbiology*, September, Vol 55. No 9.